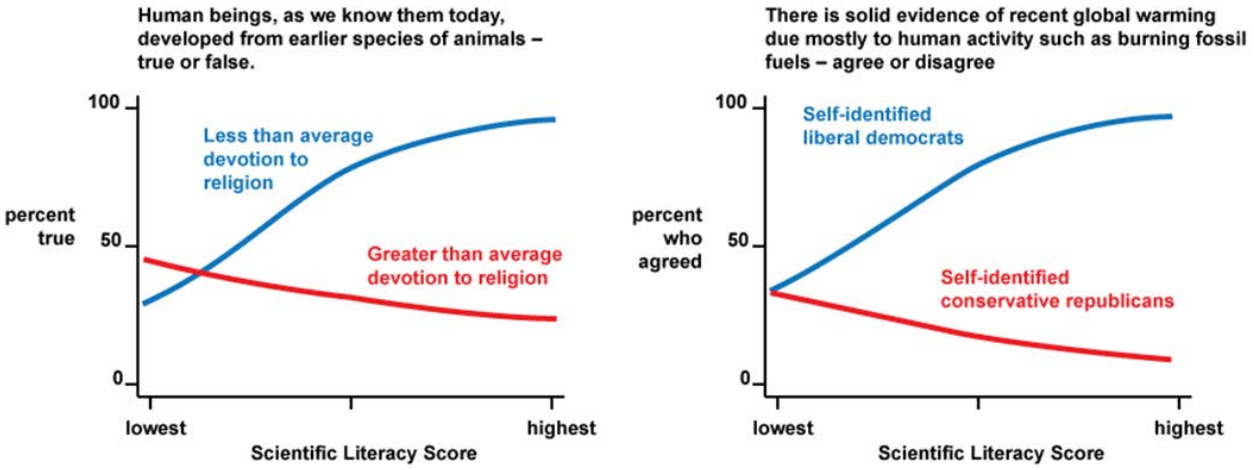
Course learning goals

Our overarching learning goal is to become an informed voter in areas related to science and especially to biology. An informed voter should be able to set personal bias aside and make informed, rational decisions concerning political and social issues.

To what extent does personal bias influence our opinions? Consider the responses to the statements at the top of the two figures reproduced below[1]. Scientific literacy was measured by percentage of correct answers to questions such as "electrons are smaller than atoms – true or false." Perhaps surprisingly, the greatest differences were among individuals who were most scientifically literate.



[1]Redrawn from: Kahan, Dan M. Climate-Science Communication and the *Measurement Problem*. *Advances in Political Psychology*, 20 Feb 2015. DOI: 10.1111/pops.12244

Without taking a stance on who is "right" or "wrong," we can conclude that a significant percentage of voters do not understand the process of science, do not have a sound knowledge of basic science, have difficulty identifying reliable sources of information, and/or do not or cannot employ objective reasoning as they develop an opinion on matters related to science.

Learning objectives

As you look over the learning objectives for this course, be cognizant of one objective that is not among them. You are not expected to submit to the orthodox viewpoint in any area. On the other hand, you will be expected to be able to defend your viewpoint regardless of the position that you take on a subject. You will have to defend the credibility of your sources and will be expected to present rational explanations that employ logical reasoning.

Objective 1: Develop a solid understanding of the process of science and an appreciation for the credibility of scientific research and theories

1. Be able to distinguish what is in the realm of science from what is not in the realm of science
2. Learn to apply skepticism of a scientist
3. Learn to distinguish scientific fact from fiction, theory from conjecture, valid from spurious arguments, and to distinguish truth from myth or misconceptions
4. Be able to correctly explain what is mean by a scientific theory

5. Be able to distinguish what a theory claims from what it does not claim
6. Be able to cite examples of the slow, deliberate, progressive nature of science

Objective 2: Obtain a working knowledge of fundamental concepts in biology

1. Learn the roles of macromolecules and organelles in the function of living cells, and the roles of cells, tissues, and organs in the function and survival of living organisms.
2. Be able to explain the role of evolution, especially common ancestry and natural selection, in biology and biological research. *No concepts are more fundamental to biology than common ancestry and natural selection (i.e., evolution). Physical explanations for the formation of the universe, solar system, appearance of life on earth, and origin of species are common themes that will run throughout the course.*
3. Be able to explain the processes and consequences of gene expression, including how genetic information is stored, replicated, and inherited, how phenotype stems from gene expression, how genetic changes guide human development from egg to adult, and how gene expression can go awry, leading to cancers, immune deficiencies, etc.

Objective 3: Be able to recognize and access credible sources of information in biological and biomedical science

1. Be able to conduct a productive search for reliable information using the internet
2. Be able to distinguish reliable from less credible internet sources, cite evidence, and defend your sources
3. Be able to access and read a peer-reviewed journal article

Objective 4: Be able to convincingly present a point of view orally, in writing, and/or by using visual aids

1. Prepare and conduct an oral presentation that accurately and effectively presents a scientific topic to a lay audience, including support materials such as a PowerPoint slide show, handouts, posters, models, etc., as needed
2. Provide informative answers to questions from an audience, and
    - be prepared to challenge spurious claims and arguments that misrepresent scientific concepts and/or the process of science
    - be prepared to explain how evidence led to an explanation
    - be able to explain the faulty reasoning behind myths and misconceptions surrounding a explanation, including scientific theories
3. Respect the views of others and refrain from uncivil behavior, no matter how passionate you are about the subject.

Note to prospective BioSciences majors

In addition to the learning goals listed above, an objective of this course is to encourage students with strong interests in biology to consider a major in BioSciences. If you decide to pursue the major you will need to take Introductory Biology (BIOC 201). BIOC 122 is good preparation but is not a substitute for BIOC 201.

Policies, Topics, and Activities for Fall 2017

NOTE: This course syllabus is a work in progress, pending information on class size and student input on special topics to be covered. This syllabus subject to change at any time, with adequate notice.

Much of the learning in this course will take place in class, mostly through group work and discussions. Much of the learning will also take place as you prepare for class. Preparation will include searching for information and preparing class presentations. There will be some lecturing, but this is not a traditional lecture course, and we do not use a textbook.

Course instructor

Your instructor is Dr. David Caprette, ABL 327 (Anderson Biological Laboratories, third floor), 713-348-3498, caprette@rice.edu. Please notify Dr. Caprette of any problem concerning attendance, grading, or course materials. Please see HERE for office hours.

Honor code policy

Unless otherwise indicated, assignments are "open resource" and "open to collaboration among members of your group." Otherwise, any restrictions will be identified at the beginning of the assignment description and announced in class. Open resource means that students may have access to their notes, posted resources, internet, texts, library materials, and any other reference materials while working on an assignment. Open to collaboration among members of your group means that you are encouraged to work on an assignment with others in your assigned study group but must not seek help from other individuals.

Every final product must be prepared in your own words – you are not to plagiarize. For example, you must not simply quote directly from web sites. Please consult the document on academic integrity that I've posted in Resources if you are not sure what constitutes acceptable behavior.

Absences, late arrivals, and late assignments. The honor code applies to requests to be excused from participation or for permission to submit an assignment late. Legitimate excuses for missing class include circumstances beyond your control such as illness, death in the family, travel for athletics, graduate school interviews, etc. Students arriving late to class without an acceptable excuse will receive partial credit for attendance. Any student experiencing a problem submitting an assignment must contact the instructor immediately. Ten percent of the available score will be deducted per day an assignment is late. If you know in advance of a planned activity that will take you out of class, you are expected to notify the instructor as soon as you are aware of the activity. This requirement includes activities that are on your schedule at the beginning of the semester.

Learning activities

In class we will conduct presentations, group discussions, and hands-on activities. We will also use an audience response system (Socrative) for voting, to check your understanding of concepts, and to address misconceptions. You will need a cell phone or laptop computer to access Socrative. In class you are expected to use electronic devices solely for course-related activities. Shopping online or scanning through Facebook, for example, may result in a zero for the day's class participation score. To promote full participation in class and to avoid distractions, the instructor may ask you to silence or shut off electronic devices and/or to keep your laptops closed.

Every pre-class preparation assignment, day's participation, and minute question (see below) counts equally toward your learning activity score ***subject to instructor override, if applicable.***

Pre-class preparation. Most classes will require completing some sort of pre-class assignment, either individually or as a group. Assignments may include online quizzes, which may or may not be graded. Graded assignments will be identified as such.

- You will receive full credit for a pre-class assignment if you complete the work and attend the corresponding class
- If you complete a pre-class assignment but miss the corresponding class, then the assignment will not count toward your course grade
- If you fail to complete an individual pre-class assignment or your part of a group assignment, a zero will be recorded

Participation. Your on-time attendance and full participation in class activities are essential. You will receive a score of 100% for each day that you arrive in class on time and give the class your full attention and effort.

Presentations. You will receive a score for each in-class preparation assigned to your group. Grading criteria will include the extent of your contribution to the assignment, accuracy and credibility of the information you provide, clarity of presentation, and ability to field questions.

Minute questions. In many classes you will be given 1 to 3 minutes to answer a question on an index card that will be passed out some time during class, often at the very start. Minute questions will be graded and will count toward your final grade in the class. Because minute questions assess students' retention of material presented in the prior class, students missing a class due to illness or family emergency will not be held responsible for correctly answering a minute question during the following class. Students missing class due to travel or other planned absences are expected to review the missed material on their own, and will be responsible for the corresponding minute question.

Instructor override. I reserve the right to modify your participation grade based upon your level of engagement in the class. I might override a low participation score for a student who misses an assignment or two but is otherwise enthusiastic about the class and contributes significantly to its success. I may also have to reduce a participation score for any student who detracts from the success of the course. Perhaps the most egregious of offenses, aside from an honor code violations, is failure to prepare. If a student fails to prepare for a class presentation, for example, resulting in lost class time and/or requiring me to take over the presentation, the penalty will be 50% of the participation grade. A second such incident will result in loss of the entire participation grade. Of course, no one will risk that steep a penalty, right?

Exams

Midterm "mini-exams," 30 min each, will be given in class. There will also be a cumulative final exam. A student must provide at least a week's advance notice if he/she will miss an exam due to circumstances beyond his or her control. In such cases the student may take the exam early at an alternative time and place. Only in the case of a sudden illness, family emergency, or other unexpected event will a makeup exam be given after an exam is missed. The instructor reserves the option of providing makeup exams that are different from the corresponding scheduled exams.

Students with disabilities

Any student with a documented disability needing adjustments or accommodations is requested to speak with the course coordinator during the first two weeks of class. All discussions will remain confidential. Such students should also contact Disability Support Services in the Ley Student Center.

Course grade

Please check the gradebook frequently and report any errors or omissions. The breakdown of your course grade will be as follows:

- Learning activities, 20%
- Midterm exams, 50%
- Final exam, 30%

Grade cutoffs are as follows: ≥ 97% = A+; 93-97 = A; 90-93 = A-; 87-90 = B+; 83-87 = B; 80-83 = B; 77-80 = C+; 73-77 = C; 70-73 = C-; 67-70 = D+; 63-67 = D; 60-63 = D-

Schedule

BIOC 122 will meet Tuesdays and Thursdays from 10:50 am to 12:05 pm, location to be determined. We will follow a "rolling schedule" such that we will take as much time on each topic as we need and then move immediately to the next topic.

- Ask any questions you may have, make any points that you wish to share with the class, and clear up any confusion or misunderstandings that you may have before we leave a subject
- When the next topic comes up, any assignments associated with that topic will come due immediately, including group presentations; I will try to provide plenty of advance notification

Topics, starting Tuesday Aug 21

The course and assignment schedule must remain unfinished until (1) I know the class size, and (2) you have had a chance to suggest special topics for the latter half of the course.

Part one – Foundations

- Introduction to the course, course objectives, and active learning (one class period)
- The great organelle debate: group research, organelle "draft," "Elite Eight" organelle tournament
- "Sixty percent" – The unique properties of water, and the roles of water in supporting life
- "Out of thin air" – From where do organisms acquire matter and energy? How do organisms convert chemical energy to a useful form?
- First "mini exam," beginning of the 6th or 7th class meeting, depending on our pace
- "Red stuff" – Bone, blood, and the circulation
- Genetics
- The process of science

Part 2 – Biology for Voters

The three topics listed below have been chosen by the instructor. Students and instructor will team up to choose remaining topics, which should include topics in the news, current controversies, and/or any subject area that the class decides to prioritize.

- Evolutionary theory: the argument for descent with modification
- Evolutionary theory: principles of natural selection
- Evolutionary theory: the evolution of altruistic behavior